Policy, education and social change: fifty years of progress

By Catherine Hill and Erin Prangley

This paper was prepared with funding from the U.S. Department of Labor. The views expressed are those of the authors and should not be attributed to the Federal Government or the Department of Labor.

Fifty years ago, President Kennedy created the President's Commission on the Status of Women ("Commission") to conduct a comprehensive analysis of the status of women in America and produce recommendations for advancing women in the workplace and throughout society. Significantly, the Commission began its report with the topic of education. At the time, women were a minority of students on college campuses and a small fraction of students in business, law, and medicine. Educating women was viewed as a logical way to effect change and open doors for women in the workplace. Today, women make up a majority of college students and nearly half of students at professional schools. Yet in some areas, including women's inclusion in science, technology, engineering, and mathematics, we still fall short.

As a participant in the 1963 Commission, the American Association of University Women (AAUW) is especially pleased to participate in this retrospective of the Commission's work. This paper begins with educational conditions in the 1960s and then focuses on the most notable educational gains and shortfalls of the past five decades. The impact of women's educational gains on occupational choice and pay are explored, followed by a discussion of the role of public policies in these educational advances. The paper concludes with new and old challenges facing girls and women, including the rising costs of higher education and the underrepresentation of women in science, technology, engineering, and mathematics.

Gender Equity in Education: the Past

In 1963, the gender gap in education was substantial, most notably in higher education. The Commission's Report states:

> "Because too little is expected of them, many girls who graduate from high school intellectually able to do good college work do not go to college. Both they as individuals and the Nation as a society are thereby made losers." (p. 4)

In 1962, few Americans aged 25 and older had a college education, including 7 percent of women and 11 percent of men. Adults aged 25-29 were more likely to be college-educated than the population as a whole, but the proportions were still small relative to modern measures, with only 9 percent of women and 17 percent of men being college graduates. Among those graduating in 1962-63, women were awarded 41% of the Bachelor's degrees, 32%

of the Master's degrees, and 11% of the PhD degrees (U.S. Department of Education, National Center for Education Statistics, 2004, Table 247).

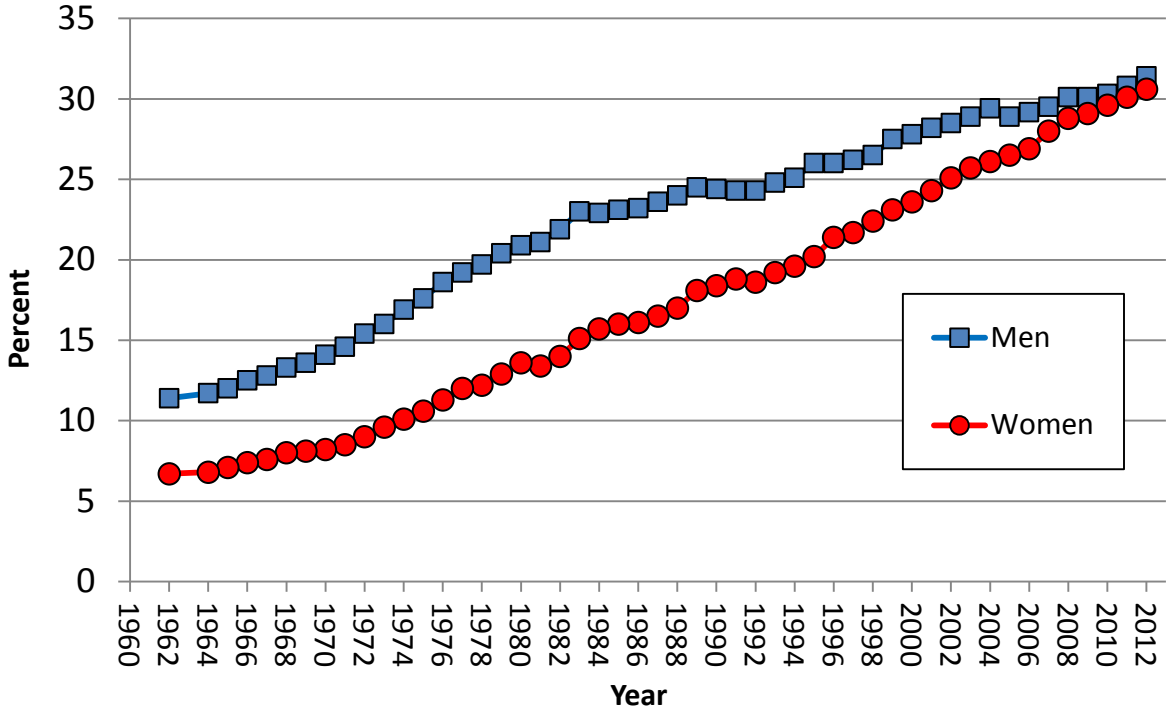
At the time of the Commission's Report, women were underrepresented at all levels of graduate education and overwhelmingly underrepresented at professional schools.

The 1963 Commission report recognized that improving educational attainment was essential for meaningful progress in the workforce. The Commission Report presented both traditional and modern arguments for women's advancement. For example, the Commission noted that a woman needed to continue her education in one form or another "in order to provide assistance, companionship and stimulation needed by her husband and by her children as they develop" (p. 10). This was presented as a reason for educating women, along with the fact that most single women worked for a large part of their lives and many young widows and married women from low-income families worked outside the home even when they had young children (Report, p. 10). Without adequate education or vocational training, women would be underemployed and unable to support themselves or their families. The Commission placed special emphasis on the need for postsecondary education for women.

Gender Equity in Education: The Present

The 1963 Commission Report's emphasis on higher education was prescient. During the past five decades, Americans have invested in higher education in record numbers, and women have made especially large gains. As noted earlier, in 1962, a year before the Commission's Report, 11 percent of men and 7 percent of women ages 25 and older had at least a college degree. Today, about one-third of both women and men ages 25 and older have completed at least a four-year college degree. The proportion of men with a college degree has risen steadily, but the proportion of women with this credential has risen more quickly. Today, women and men are equally likely to have a college degree or more.

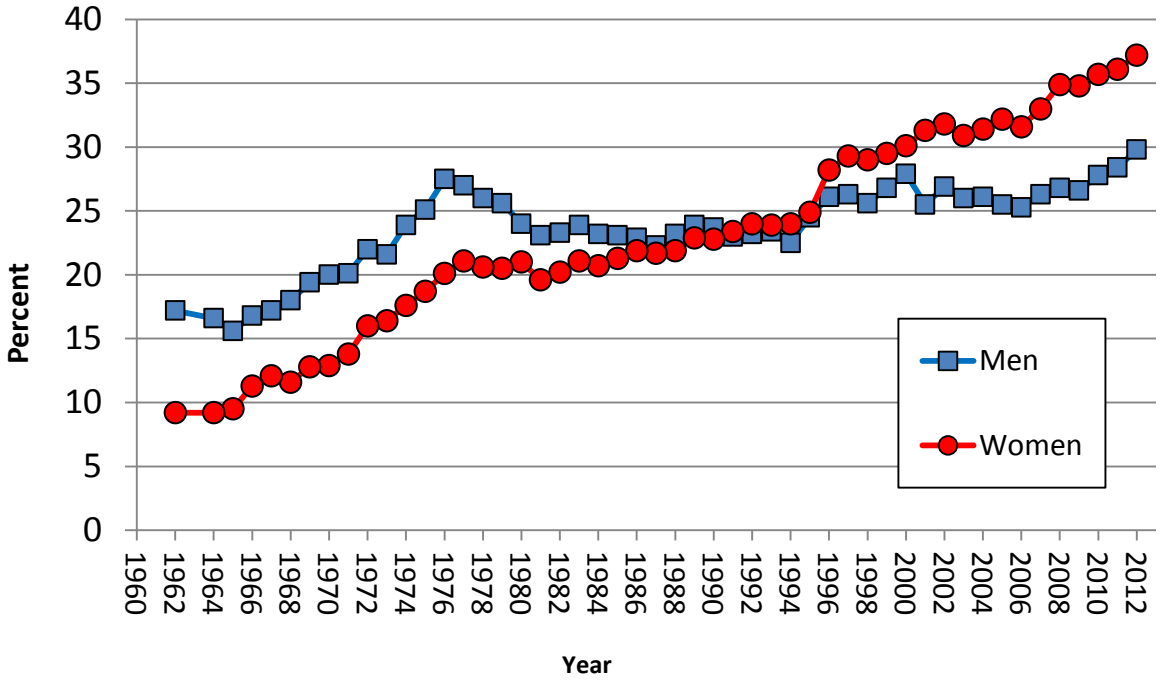
Figure 1. Percent of Men and Women ages 25 and older with a College Degree or More



Source: 1962-2002 March Current Population Survey, 2003 to 2012 Annual Social and Economic Supplement to the Current Population Survey (noninstitutionalized population, excluding members of the Armed Forces living in barracks)

The trends are even more impressive among younger adults (Figure 2). Among individuals aged 25-29, women are more likely than men to have earned a college degree. Thirty-seven percent of women aged 25-29 hold a college degree today compared with 30% of their male peers. In contrast, men were more likely than women to have a college degree in 1962 by a similar margin. Assuming that current trends continue, we can shortly expect women to outpace men in college attainment within the full population. Among young adults ages 25-29, women are now more likely than men to be college educated.

Figure 2. Percent of Men and Women ages 25-29
with a College Degree or More



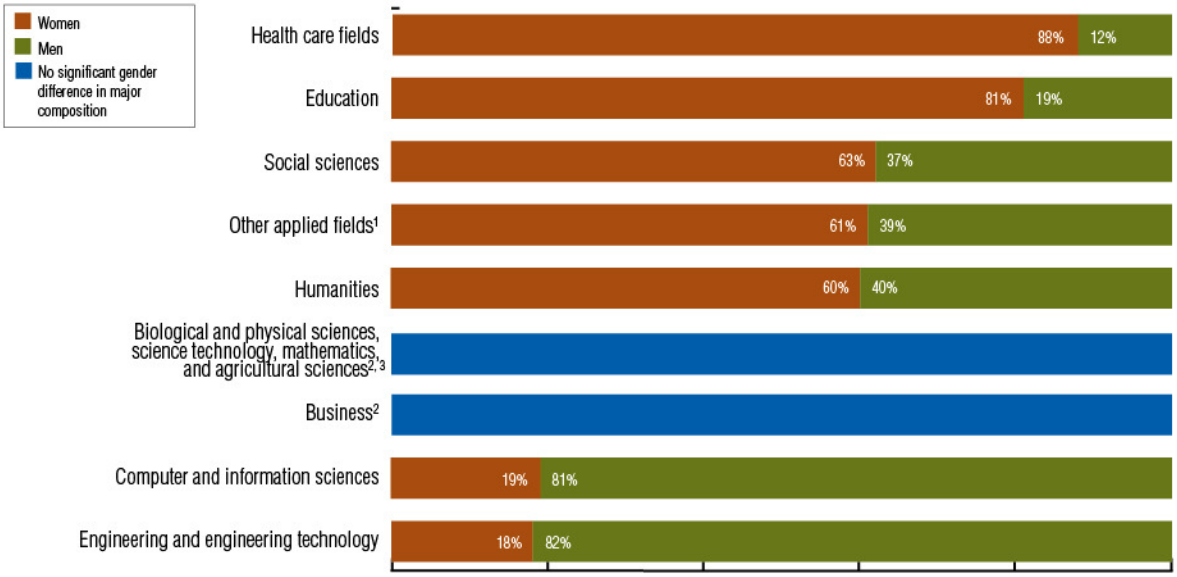
Source: 1962-2002 March Current Population Survey, 2003 to 2012 Annual Social and Economic Supplement to the Current Population Survey

As more women have earned college degrees, the number of women pursuing law, business, medical, and graduate degrees has grown. Today, women are earning nearly half of the degrees in many professional fields. For example, in academic year 1959-1960, women made up five percent of the graduating class for medical schools, three percent for law schools, and less than one percent of graduates from schools of dentistry (U.S. Department of Education, National Center for Education Statistics 2013). In academic year 2011-2012, women accounted for 47 percent of graduates from law schools, 48 percent of graduates from medical school and 45 percent of the graduating class for schools of dentistry.

Women are the majority of college students, but they do not dominate all fields of study. As seen in Figure 3 below, women tend to major in health care and education, while men are more likely to major in computer science and engineering. Women and men are about equally likely to major in business and biological and physical sciences, and women are the majority of

students in the social sciences and the humanities. These data illustrate that the persistence of "sex stereotyping" is still at play on college campuses.

FIGURE 3. Gender Composition of College Majors



Note: This chart shows undergraduate majors among 2007–08 bachelor's degree recipients and excludes graduates older than age 35 at bachelor's degree completion.
Source: Authors' analysis of U.S. Department of Education, National Center for Education Statistics, *2008–09 Baccalaureate and Beyond Longitudinal Study* data.
[1] Includes architecture, communications, public administration and human services, design and applied arts, law and legal studies, library sciences, and theology and religious vocations.
[2] Women and men each make up about half of graduates who majored in these fields. Percentages are not significantly different for men and women ($p < 0.05$, two-tailed *t*-test).
[3] Although these majors are gender balanced as a group, the representation of women varies substantially among the majors included in this category. Women are more likely than men to major in the biological sciences, and men are more likely to major in the physical sciences, agricultural sciences, and mathematics (National Science Foundation, 2011, table 5-1).

Indeed sex segregation by field is more pronounced than this figure conveys, because sex segregation occurs within subfields as well. For example, the "biological and physical sciences, science technology, mathematics and agricultural sciences" in Figure 3 is broad, and when we pull apart different components, differences by gender are apparent. Specifically, men are much more likely than women to go into physics while women are most heavily represented in the biological/agricultural sciences.

Not all women benefitted equally from this "education surge." Hispanic women are especially underrepresented in American colleges, together with Hispanic and African American men. At the K-12 grade level, a considerable achievement gap separates African American and Hispanic students from their White and Asian-American peers, reflecting differences in educational access and other factors. Overall, children from low- or moderate-income families are less

likely to pursue and graduate from college than their higher-income peers (Corbett, Hill and St. Rose, 2008). Still, educational attainment for women in all racial and socio-economic categories has generally increased, albeit not to the same extent.

Title IX: Policy Making a Difference

It is tempting to attribute these successes to the individual women who took the bold step of pursuing an advanced degree in an era when few women did. Indeed, these "first women" played a special role in opening doors for women. But any change of this magnitude requires social as well as individual action. Title IX of the Education Amendments of 1972 was instrumental in opening to women colleges and universities, many of whom had quotas for or were closed to women.

Title IX was a short amendment added to the Education Act of 1972, reading:

> No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance…

The law was not viewed as revolutionary for its time, yet Title IX did not pass easily. Activists such as Dr. Bernice Sandler, sometimes called the "Godmother of Title IX," fought for its passage. Between 1969 and 1971, Sandler filed approximately 250 sex discrimination complaints under a novel cause of action: enforcement of an Executive Order by President Johnson that prohibited sex discrimination within institutions with federal contracts. She organized testimony and collected stories about sex discrimination in education, including the exclusion of women from the University of Virginia, the policy prohibiting married women as students at Georgetown University's School of Nursing, and the fixed quota for women students (two women per year) at Cornell University's School of Veterinary Medicine.

Sandler had many allies in the civil rights community fighting for Title IX. Political leaders such as Representatives Edith Green and Patsy Mink and Senator Birch Bayh advocated effectively

for Title IX, which passed on June 23rd, 1972. The new law made clear that sex discrimination in education would not be tolerated, albeit some exceptions, including single sex education, remained. Colleges and universities could no longer use quotas to restrict the number of female students. Indeed, following the enactment of Title IX, female applicants to colleges and universities surged, especially in professional fields such as law, medicine, and business. Title IX also required schools to accommodate pregnant and parenting students, ending the common practice of asking women to leave school if they became pregnant.

The impact of Title IX has been substantial and on-going. It is best known for its role in opening up athletic opportunities for women and girls at schools receiving federal funds (nearly all do). The rapid growth in athletic accomplishments by girls and women has received the lion's share of political and media attention. Yet Title IX provisions are not directed only toward parity in athletics. Indeed, Title IX requires that educational institutions receiving federal funds address a broad spectrum of issues. For example, Title IX also covers the issue of school "climate," including sexual harassment, to the extent that these issues affected students' ability to get an education. Today, Title IX plays a critical role in prohibiting harassment based on sexual orientation as a form of gender bias. Finally, the law establishes standards for gender equity in all schools, including single-sex schools.

The success of Title IX, along with other educational accomplishments by women, has been so remarkable that some express concern that men are being surpassed. It is rare that a struggle for equality is so successful that there is actually a (perceived) reversal of fortune that is replete in academic and popular writing. For example the Association of American Medical Colleges recently called for a "male pipeline" to encourage more men to pursue medical degrees – despite the fact that women made up only 47 percent of medical school applicants (AAMC 2012, 12). In the fields of computer science and engineering, women remain a distinct minority at every level of higher education.

Many other factors contributed to the educational advances of women over the past five decades. The civil rights movement paved the way for new thinking about women's roles in society and broke down stereotypes about women's intellectual abilities. A vibrant feminist

movement emerged at many colleges and universities, furthering new thinking about gender roles. Ultimately, it was up to individual women to pursue educational opportunities now available to them. These remarkable gains, however, took place in the context of a new social movement and legislation such as Title IX which established new rules for gender equity at all levels of education.

The Perkins Act: Forging New Pathways for Women

In 1984, Congress passed the Carl D. Perkins Vocational and Technical Education Act to fund vocational education programs at secondary and postsecondary institutions across the country. The purpose of the law was to provide high quality career and technical education essential to meeting the needs of the nation's evolving high-tech workplaces.

Originally, the Perkins Act had included programs specifically to help special populations such as displaced homemakers re-entering the labor force, single parents, and students seeking non-traditional employment training — the majority of whom are women. The Act contained state funding requirements that were intended to help ensure women and girls had equal access and opportunity to succeed in vocational education. However, during reauthorization in 1998, these Perkins Act programs were restructured into block grants to states so that they could implement programs based on the state's determination of greatest need. Without explicit direction from the federal government to fund programs for women and other underrepresented groups, few states chose to allocate funding for these purposes. This resulted in program closures and significantly reduced services for women in transition to the workforce.

Today, a different kind of literacy is required to meet the demands of the global economy. Career and Technical Education (CTE), also commonly referred to as vocational or occupational education, has become a vital component of post-secondary education. The majority of CTE students attend community colleges (U.S. Department of Education USDOE, 2008). Students can earn a certificate or an associate's degree in a variety of career-focused programs that

prepare them for what are known as “middle-skill” jobs. “Middle-skill” jobs require more than a high school education but less than a Bachelor's degree and include jobs in early childhood education, healthcare, and law enforcement, as well as STEM-related fields like agriculture, engineering technology, and automotive technology (Carnevale, Jayasundera, & Hanson, 2012).

However, men and women are concentrated in different middle-skill fields. According to the US Department of Education (2008), in academic year 2007-8, men were nearly three-quarters or more of CTE sub-baccalaureate students in computer and information services, engineering and architecture, and manufacturing, construction, repair, and transportation. Women were three-quarters or more of students in consumer services, education, health services and public, legal, and social services.

Gender segregation in school is reflected in the workforce. In 2009-2010, the most common fields for women with an associate’s degree in career education were business and health (US Department of Education 2010). Nearly two out of three women with an associate’s degree work in these fields. The most popular fields for men with an associate’s degree in career education were business, engineering, and information technology. As should be expected, gender segregation in education contributes to gender segregation in the workplace. Women are more likely to be in healthcare, office occupations, and cosmetology, and men are more likely to work in automotive mechanics, electrical technology, transportation, HVAC (heating, ventilation, and air conditioning) and refrigeration. With the exception of nursing and health-related fields, traditionally-female fields pay less than non-traditional fields for women (Carnevale, Jayasundera, & Hanson, 2012).

In 1963, the Commission pointed to poor career counseling services, and unfortunately, career counseling is still an issue today. Occupational programs at community colleges often rely heavily on assessment tests that more accurately predict men’s educational abilities than women’s (Armstrong, 2000). Counseling based on these tests may reproduce the gender segregation in the workforce by directing women into traditionally female fields and men into

traditionally male occupations (Marini & Brinton, 1984). For example, tests may state that fields like welding and auto mechanics require that individuals be physically fit and able to lift heavy objects, so women are advised not to select these fields because it is presumed that they do not possess those characteristics (Lester, 2010) despite considerable evidence to the contrary. Gender stereotyping in career counseling remains an issue today, in much the same way that the Commission found it in 1963.

A key setback in efforts to promote gender equity in vocational education occurred in 1998. As noted above, funds to address special populations, including women in non-traditional fields and displaced homemakers, were eliminated from the Perkins Act at that time in the hopes that they would be provided by the states under the newly-created Workforce Investment Act of 1998 (WIA). WIA's goals were simple – help workers transition into high-skill, high-wage jobs -- and WIA gave states block grants to implement programs that met these needs. Congress believed the "special populations" that had been served under the Perkins Act could be better served under the new WIA legislation as part of more generic services to "dislocated workers." However, without the explicit direction from the federal government to fund these programs for women, few states chose to allocate funding, and thus these populations have gone un- or underserved since 1998.

Today, the Perkins Act continues to fund career and technical education programs at secondary and postsecondary institutions across the country. Some of the gender equity provisions in the law have been strengthened to require states to meet targets for placing males and females into programs leading to "nontraditional" occupations (occupations where the disadvantaged sex comprises 25 percent or less of total employment). The law also authorized sanctions and required triggers for state and local improvement plans for not meeting performance measures. Unfortunately, a 2013 study by the National Coalition for Women and Girls in Education recently found that women and girls make up only a small percentage of students enrolled in the majority of programs funded by the Perkins Act that provide training for jobs in high-paying fields. For example, women make up only five percent of students at the secondary

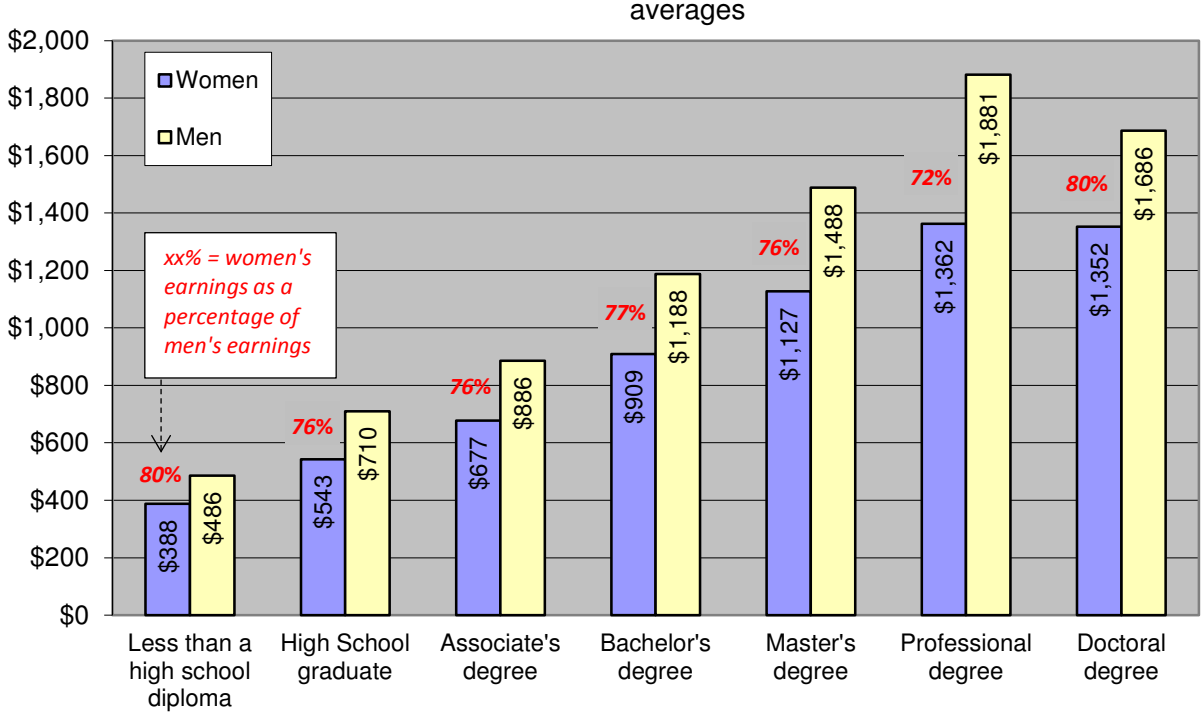
level and less than 10 percent of students at the postsecondary level enrolled in the "Architecture and Construction" cluster, which includes training for relatively high-paying jobs such as electricians (NCWGE (2013) http://ncwge.org/PDF/GenderGapinCareerPrep.pdf).

Have Educational Gains Translated Into Financial Gains in the Workplace?

Since the Commission Report of 1963, women's earnings have risen alongside educational gains. Indeed many argue that educational gains have played a large part in the narrowing of the pay gap over this fifty-year period. A college degree improves earnings considerably (AAUW, 2012), and many argue that the large increase in women's college attainment in the 1970s, 80s and 90s contributed to the narrowing of the pay gap over this time period (Goldin & Katz, 2008; Blau & Kahn, 2007; Corbett & Hill 2012).

Figure 4 illustrates the earnings of men and women with different educational backgrounds. At every increasing level of educational achievement, women's and men's earnings increase, and the gains are considerable. For example, the typical woman with a professional degree earns more than three times as much as a typical woman who has not attained a high school diploma. Yet, in each category, women earn less than their male counterparts, and indeed, sometimes earn less than men with less education. For example, women with professional degrees earn less than men with a Master's degree. Men with an Associates' degree earn nearly as much as women with a Bachelor's degree.

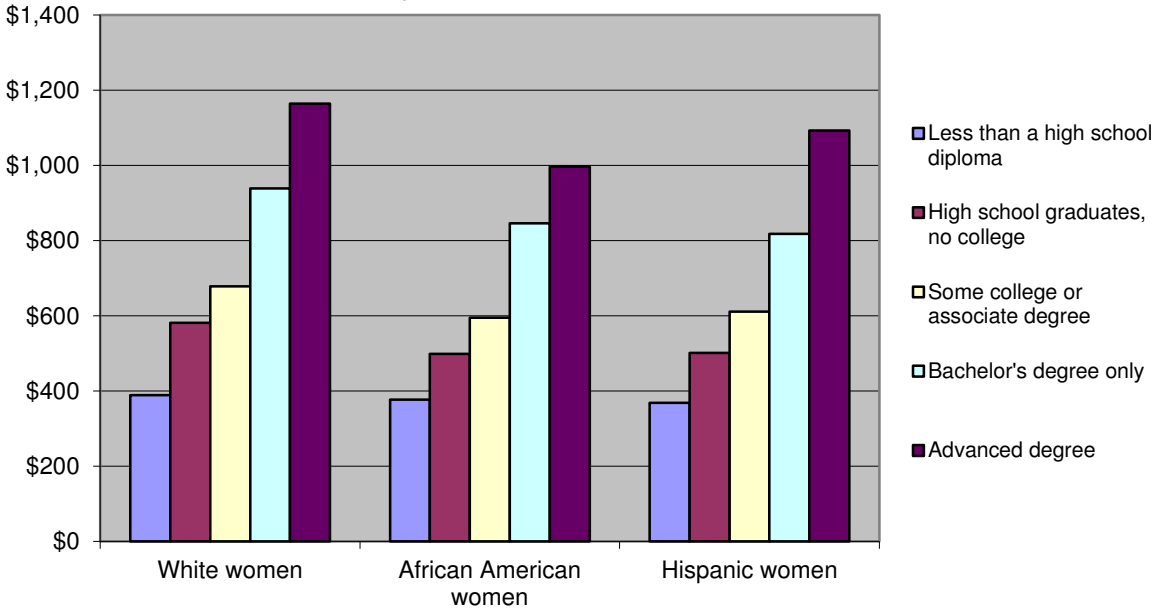
Figure 4: Median usual weekly earnings of full-time wage and salary workers 25 years of age and over by educational attainment and sex, 2010 annual averages



SOURCE: Current Population Survey, reported in U.S. Department of Labor, U.S. Bureau of Labor Statistics. December 2011. *Women in the Labor Force: A Databook (2011 Edition).* www.bls.gov/cps/wlf-databook2011.htm.

In general, educational attainment boosts earnings for everyone, regardless of race/ethnicity. Earnings gains rise in steady increments for each educational category in a similar pattern for White, African American and Hispanic women (Figure 5). White women earn slightly more than either Hispanic or African American women in each educational category. However, more educated Black and Hispanic women do consistently earn more than White women with less education. Thus, education appear to be the "tide that raises all ships," although the gains are not the same for all groups.

Figure 5. Median Weekly Earnings of Full-time Workers, by Gender, Race/Ethnicity, and Level of Education, 2012



Source: Current Population Survey, reported in U.S. Department of Labor, U.S. Bureau of Labor Statistics (January 18, 2013). *Usual Weekly Earnings Sumary Economic News Release,* USDL-13-0060. Based on median usual weekly earnings of full-time wage and salary workers, ages 25 and older, 2012 annual averages.

During the past fifty years, women have gone from a minority of college students to a majority. Women's earnings have increased substantially over this period, in part as a result of these educational gains. But the relatively slow nature of these gains and the past decade of stagnation raise the question: Why has progress on the pay gap slowed? In the remaining half of the paper, we discuss why the gender pay gap appears to persist, despite women's continuous gains in educational attainment. We explore findings from a recent AAUW study that examines the earnings of recent college graduates. We address segregation in field of study and in the workforce, and conclude with a discussion of two issues facing women in the future: women in science, technology, engineering, and mathematics (STEM) and rising educational costs.

Some College Degrees Are More Equal Than Others

As college education is associated with higher earnings, one might expect that women's rising educational attainment would result in higher earnings. Yet, a recent study by AAUW suggests that not all college degrees are equal when it comes to earnings. In a recent study on the pay gap, AAUW analyzed the earnings of men and women who graduated from college in academic year 2007–08 and who were working full time in 2009, using the nationally representative U.S. Department of Education dataset Baccalaureate & Beyond. The report, *Graduating to a Pay Gap: The Earnings of Women and Men One Year after College Graduation*, offers a particularly valuable view of the pay gap in that it studies men and women at a stage of their careers when they tend to be more similar to each other. Most are young — 23 years old, on average — relatively inexperienced in the workplace, have never been married, and were not raising children at the time of the study. The broad similarities in the lives of men and women at this time allow a relatively straightforward and objective comparison.

AAUW found that, one year after college graduation, men are already paid more than women. Among full-time workers one year out of college, women were paid an average of just over $35,000, while men working full-time were paid an average of nearly $43,000. This means that women were paid 82 percent as much as the men in their graduating class.

Why do women graduate to a pay gap? In part, the pay gap reflects men's and women's choices, especially the choice of college major and the type of job pursued after graduation. Yet, not all of the gap could be "explained away"[1] by these or other factors. After accounting for college major, occupation, industry sector, hours worked, workplace flexibility, experience, educational attainment, enrollment status, GPA, institution selectivity, age, race/ethnicity, region, marital status and children, a *five percent difference in the earnings of male and female college graduates one year after graduation was still unexplained*. A similar analysis of full-

time workers ten years after college graduation found a *12 percent* unexplained difference in earnings. Other researchers have also found that the gender pay gap is not fully accounted for by choices workers make (Blau and Kahn, 2006; Bobbitt-Zeher, 2007).

Impact of Women's Educational Attainment in the Workforce

Despite the changes in women's educational attainment and the greater number of women working full-time for longer periods, women and men still tend to work in different kinds of jobs. In 2010, the U.S. civilian workforce included 139 million full- and part-time employed workers; 53 percent were men, and 47 percent were women (2011 Earnings &Employment Online, BLS, Jan 2011). Almost 40 percent (39.7 percent) of working women were employed in traditionally female occupations such as social work, nursing, and teaching. In contrast, less than 5 percent (4.5 percent) of men worked in these jobs. This "segregation" of occupations is a major factor behind the pay gap (Reskin & Bielby, 2005; IWPR, September 2010).

Forty-four percent of men worked in traditionally male occupations, such as computer programming, aerospace engineering, and firefighting, compared with only 5.5 percent of women in those jobs (IWPR, April 2010). Overall, women are more likely to work in professional, office and administrative support, sales, and service occupations, and men are more likely to work in construction, maintenance and repair, and production and transportation occupations. There are gender differences even within professional occupations. For example, men are more likely to work in computer and mathematical occupations and architecture and engineering occupations while women are more likely to work in community and social service occupations and education, training, and library occupations. Their proportions are more similar in legal occupations and life, physical, and science occupations, although there is still considerable variation occupation by occupation within those categories.

Although men and women still tend to work in different occupations, occupational gender segregation has decreased over the 50 years since the Commission released its Report. The reduction in gender segregation is largely due to women moving into previously predominantly

male jobs, especially during the 1970s and 1980s (Blau, Ferber, & Winkler, 2006) and to faster growth of more mixed-gender occupations in the 1990s (IWPR, 2010).

The pay gap is clearly affected by educational and occupational segregation and gender stereotypes, along with many other factors. Simply understanding that these connections exist goes a long way toward explaining the changes since the Commission Report of 1963. The Commission took hold of a blossoming movement to update women's roles in society and identified ways that the federal government could support women's civil rights. Title IX and other legislation helped set in motion a change that was already in the hearts and minds of many Americans. While the Commission laid out an ambitious agenda more than 50 years ago, a key area for improvement – integrating all areas of study – has not yet been fully realized.

Agenda for the Future

The last segment of this paper examines two key challenges going forward. The first is a key issue highlighted in the 1963 Report that has yet to be fully addressed: Women's under-representation in Science, Technology, Engineering, and Mathematics (STEM). While progress has been made in some areas, such as biology and chemistry, women remain grossly outnumbered by men in engineering and computer science. The second concerns the rising cost of education. Alongside the growth in women at colleges and universities, the past decades have also seen a rapid rise in costs. As the majority of college graduates, women are especially affected by rising debt, and the burden of student loan debt is especially challenging for women, who tend to earn less than men. Educational opportunity was a central tenet of the 1963 Commission's recommendations, and hence the cost of higher education is a fitting issue to highlight for next steps.

Representation of Girls and Women in Science, Technology, Engineering, and Mathematics (STEM)

Advancing girls and women in these fields was a key recommendation of the Commission. The words of the Commission are surprisingly still relevant today:

> "Girls hearing that most women find mathematics and science difficult, or that engineering and architecture are unusual occupations for a woman, are not led to test their interest by activity in these fields."

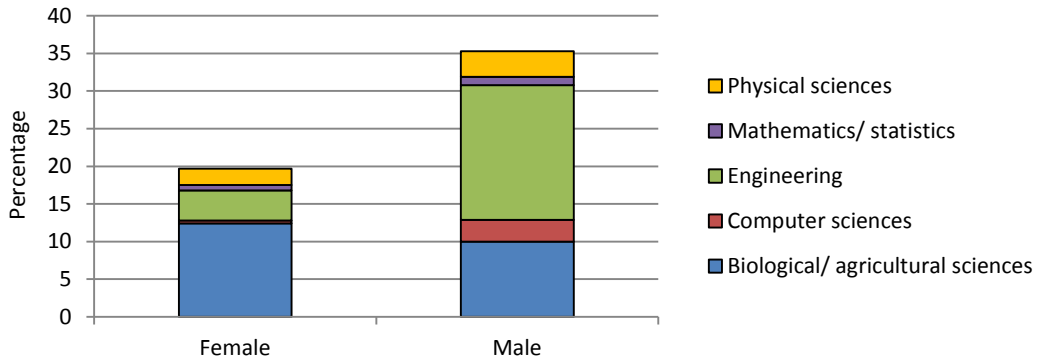
Today, girls are emerging from high school as ready as boys to pursue careers and further their education in every area, including scientific and engineering fields. According to data from the National Assessment of Educational Progress (NAEP), boys and girls have similar scores in mathematics at younger ages and boys have a small persistent advantage in mathematics among 17- year-old students. Girls have consistently outscored boys in the Reading section of the NAEP since the test began. Overall, the differences by sex are not large relative to differences by race/ethnicity (Corbett, Hill, & St. Rose, 2008).

On high stakes tests, such as the SAT, ACT and AP Exams, girls remain slightly behind boys, in part due to the greater diversity of female test-takers compared to male test-takers (Corbett, Hill, & St. Rose, 2008). Boys tend to slightly outnumber girls, and slightly outscore them, on Advanced Placement exams, including calculus, physics, computer science, and chemistry. In addition, boys outnumber girls among students with very high scores on mathematical tests, although girls are making gains (Lubinski & Benbow, 2006). The Study of Mathematically Precocious Youth identifies seventh and eighth graders who are highly gifted in mathematics, scoring greater than 700 on the SAT math section (the top 0.01% or 1 in 10,000 students). Boys are more likely than girls to be identified as highly gifted in mathematics. However, since the early 1980's the ratio of boys to girls identified in this extremely select group has dramatically declined from 13:1 (Benbow & Stanley, 1983) to around 3:1 in recent years (Brody & Mills, 2005; Halpern, Benbow, et al., 2007). Gains made by girls in the ranks of the highly mathematically gifted suggest that nurture, rather than nature, lies behind the gender gap in advanced mathematics.

Young men are much more likely to enroll in college intending to major in a STEM field. Thirty-five percent of young men begin college intending to major in a STEM field compared with just under 20% of young women (Figure 6). This figure shows that most women who intend to major in a STEM field intend to major in the biological sciences. On the other hand, the

majority of men who intend to major in a STEM field select engineering. Among first-year students, 12% of women say that they intend to major in biology/agricultural sciences compared with 10 percent of men. Eighteen percent of men say that they would like to pursue engineering compared with just four percent of women. Computer science is another area which appeals to male students dramatically more than female students. Why are men and women continuing to choose different fields? What lies behind these choices?

Figure 6. Intent of first-year college students
to major in science and engineering fields, by gender, 2010



SOURCE: Higher Education Research Institute, University of California at Los Angeles, special tabulations (2011) of the Survey of the American Freshman cited in National Science Foundation, Division of Science Resources Statistics. 2011. *Women, minorities, and persons with disabilities in science and engineering: 2011.* Special Report NSF 11-309. (Arlington, VA) Table 2-8.

Bias, Often Unconscious, Limits Women's Progress in Scientific and Engineering Fields

Most people associate science and math fields with "male" and humanities and arts fields with "female," according to research profiled in the recent AAUW report *Why So Few? Women in Science, Technology, Engineering, and Mathematics* (Hill, Corbett, and St. Rose 2010). Even among individuals who actively reject these stereotypes, implicit bias is common. This bias not only affects individuals' attitudes toward others but may influence girls' and women's likelihood of cultivating their own interest in math and science as well. Taking the implicit bias test at

https://implicit.harvard.edu can help people identify and understand their biases so that they can work to compensate for them.

Not only do people associate math and science with men, people often hold negative opinions of women in "masculine" positions like scientists or engineers (Good et al, 2012; Mangels et al., 2012).[i] Research profiled in the AAUW report shows that people judge women to be less competent than men in "male" jobs unless they are clearly successful in their work. However, even when a woman is clearly competent in a "masculine" job, she is considered to be less likable. Because both likability and competence are needed for success in the workplace, women in STEM fields can find themselves in a double bind. Luckily, stereotypes, bias, and other cultural beliefs can change; often the very act of identifying a stereotype or bias begins the process of dismantling it (Hill, Corbett, and St. Rose 2010).

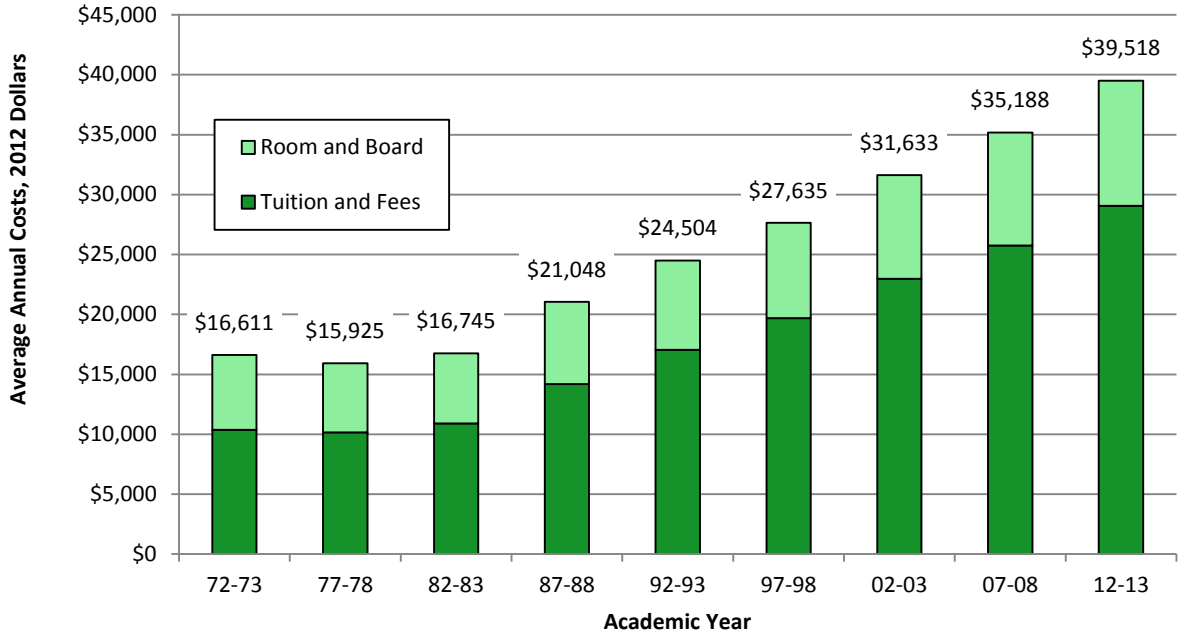
Making STEM careers feasible for women will take more than opening doors. Stereotypes and bias continue to affect women and girls in the perceptions of others and in their own self-understanding. Women have made progress in many fields once considered "male," including scientific fields such as biology and chemistry. Yet computer science and engineering remain off limits to too many women and girls. Helping girls and women to enter and succeed in these fields should be a goal for the next decades.

Access to College: The Financial Picture

No discussion of higher education is complete without a discussion of costs. College costs have become a critical issue for the nation, with tuition rising faster than inflation for most of the past two decades. Figure 7 shows tuition costs at private, non-profit colleges -- above and beyond the normal cost-of-living increases -- for the past two decades. A similar pattern can be seen among public 4-year colleges and universities. Most research indicates that a college degree pays for itself over time. But as college costs rise and more students borrow more money to finance their education, a growing percentage of students are graduating with high levels of student debt. The rising cost of college affects everyone, but women are especially

impacted. Women are now the majority of college students and a majority of students accruing loans. Student loan debt burden -- the monthly student loan payment as a percentage of monthly earnings -- is one way to measure the impact of loans on college graduates. As women graduates tend to have lower salaries less than men, they are more burdened by their student loan debt than higher-paid male graduates. Student loan burden affects graduates' ability to buy a home, get a car loan, or even make rent payments.

Figure 7. Four-Year Private Non-Profit College Annual Costs



Sources: 1987-88 to 2008-09 data from Annual Survey of Colleges, The College Board, New York, NY, weighted by full-time undergraduate enrollment; 1976-77 to 1986-87 data from Integrated Postsecondary Education Data System (IPEDS), U.S. Department of Education, National Center for Education Statistics, weighted by full-time equivalent enrollment.

Conclusion

It has been an extraordinary 50 years for women in the United States, and education has been at the heart of these advances. Today, we simply assume that women can become doctors, lawyers and businesswomen, but fifty years ago, women were an anomaly in these fields.

This remarkable journey offers two clear and important lessons. First, public policy can work. The 1963 Commission Report identified critical issues, including women's access to higher education, for increased public attention. During the course of the past five decades, many of the goals for women, especially in education, have been attained. Public policies such as Title IX and the Perkins Act played a critical role in opening up opportunities for women at all levels of education. A changing economy, media, social movements, and individual actions were, of course, also critical to advancing opportunities for women in education. The Commission's Report established priorities for advancing women through educational opportunity, and in many respects, its goals have been achieved. Yet the work is not done. Women remain underrepresented in scientific and technological fields, especially in computer science and engineering. Bias against girls and women in mathematically-demanding fields remains influential. Overall, African American and Hispanic women continue to have limited access to education, and the achievement gap among racial/ethnic groups remains an issue that narrows options for girls and boys. Finally, college costs represent a hurdle for all Americans in their efforts to achieve educational goals.

Luckily, we are standing on the shoulders of giants. The 1963 Commission Report offers an inspiring road map for the advancement of gender equity. Much has been accomplished, but gaps remain. AAUW looks forward to working with activists, academics, policymakers and others to extend educational opportunities throughout society.

Bibliography

Lubinski,D & Benbow, C.P. (2006) Study of mathematically precocious youth after 35 years: Uncovering antecedents for the development of math-science expertise. Perspectives on Psychological Science, 1(4), 316-45.

Blau, F.D. and Kahn,L.M., 2006 The gender pay gap in the 1990s: Slowing convergence. Industrial and Labor Relations Review, 60(1), 45-65.

Bobbitt-Zeher,D. (2007). The gender income gap and the role of education. Sociology of Education, 80, 1-22.

Benbow, C.P., & Stanley, J.P. (1983). Sex differences in mathematical reasoning differences : More Facts. Science. 222, 1029-31.

Corbett, Hill, & St. Rose, (2008). Where the facts are: The facts about gender equity in education. American Association of University Women: Washington, DC

Carnevale, A.P., Jayasundera, T., & Hanson, A.R. (2012). Career and technical education: Five ways that pay along the way to the B.A. Washington, DC: Georgetown University Center on Education and the Workforce.

Good, Catherine; Rattan, Aneeta; Dweck, Carol S. Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, Vol 102(4), Apr 2012, 700-717. doi: 10.1037/a0026659

Hill, Corbett, and St. Rose 2010. Why So Few? Women in Science, Technology, Engineering, and Mathematics. American Association of University Women: Washington, DC.

Lester, J. (2010) Women in male-dominated career and technical education programs at community colleges: Barriers to participation and success. Journal of Women and Minorities in Science and Engineering 16(1), 51-66.

Mangels, Jennifer, Catherine Good, Ronald Whiteman, Brian Maniscalco and Carol Dweck. Emotion blocks the path to learning under stereotype threat *Social Cognitive Affective Neuroscience (2012) 7(2): 230-241 first published online January 19, 2011 doi:10.1093/scan/nsq100*

National Coalition for Women and Girls in Education (NCWGE). (2012)Title IX at 40: Working to Ensure Gender Equity in Education. Washington, DC: NCWGE.

U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics* 2004 Table 247 (http://nces.ed.gov/programs/digest/d04/tables/dt04_247.asp).

U.S. Department of Education, National Center for Education Statistics, 2013 *Digest of Education Statistics* Table 321 (http://nces.ed.gov/programs/digest/d12/tables/dt12_321.asp)